

VALVES

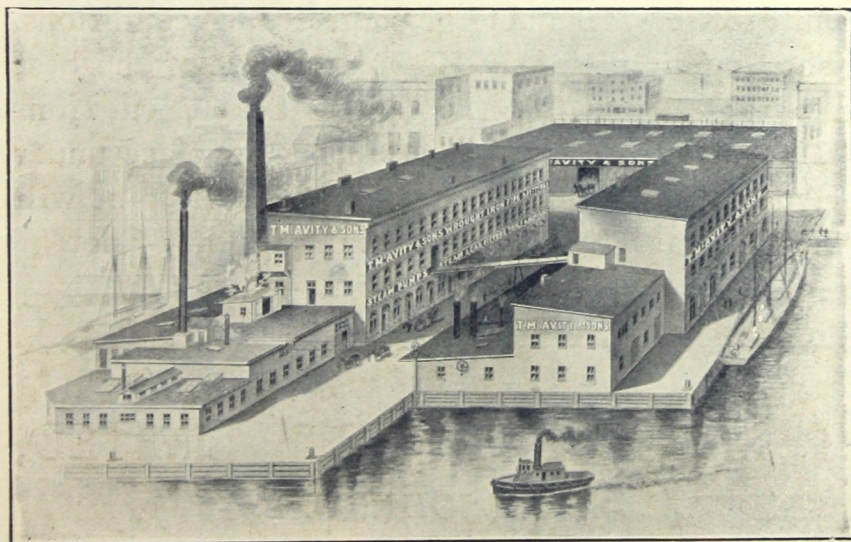
AND THEIR MANUFACTURE

T. McAVITY & SONS, LTD.
BRASS AND IRON FOUNDERS

HEAD OFFICE
AND
WORKS
SAINT JOHN, N. B.
CANADA

BRANCHES:
MONTREAL
TORONTO
WINNIPEG
VANCOUVER
LONDON, ENG.
DURBAN, S. A.

The "Brass Works"



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CCA

VALVES

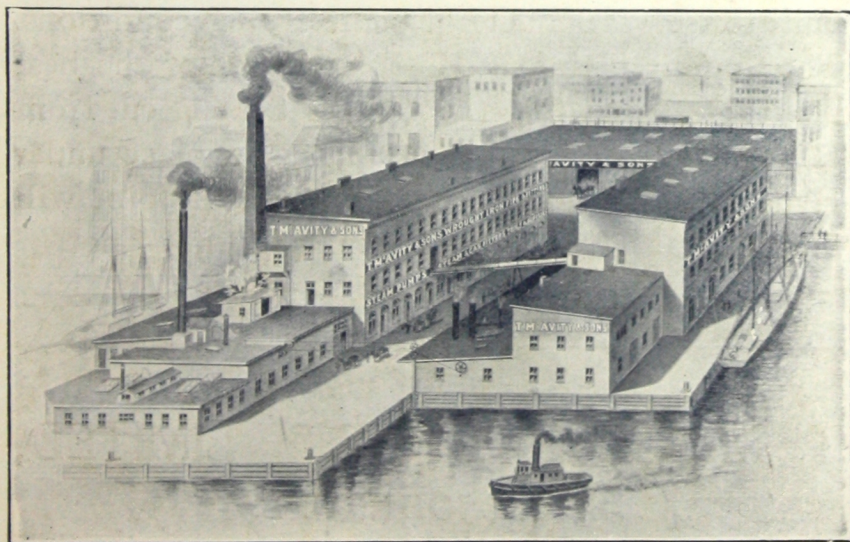
AND THEIR MANUFACTURE

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BRASS AND IRON FOUNDERS

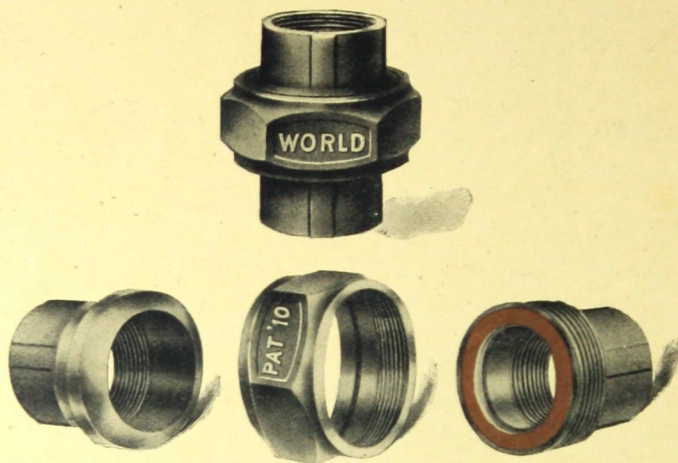
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The "Brass Works"



“World” Unions



Are as good as the rest of the Steam Specialties made by T. McAVITY & SONS, LIMITED under the “WORLD” Trade Mark and, like them, are built for service under the most trying conditions. The Coupling Ring and Tails are made of the best Malleable Iron while the Copper Seat is cut from Heavy Rolled Sheet and is locked in place under Hydraulic Pressure. The Ground Ball Joint will find its Seat whether the Piping is in line or not.

T. McAVITY & SONS, LIMITED,
SAINT JOHN, N. B.

VALVES

AND THEIR MANUFACTURE

ISSUED BY

T. McAVITY & SONS, LIMITED

SAINT JOHN, N. B. CANADA

THERE is probably no single item used to-day in connection with the use of steam as a motive power, as important as is the valve. Without it, the only alternative to allowing an engine to run on indefinitely, would be to draw the fires from under the boilers and allow the steam pressure to go down. In fact there could be no engines, for, with the exception of the turbine, a steam engine is merely a system of automatic valves which allows the steam to operate on a piston and so to transmit power to a fly-wheel.

This is, of course, all accepted as fact, and if the gentleman who invented the valve, had'nt done so when he did somebody else would have undoubtedly conferred that blessing on mankind very shortly after.

The fact remains, then, that valves can 'be obtained, and some very good ones at that, and it will probably be of interest to a user to follow the making of a brass globe valve, from Ingot Metal to Warehouse, through the shops of one of the largest Brass Manufacturing Concerns in the Dominion of Canada.

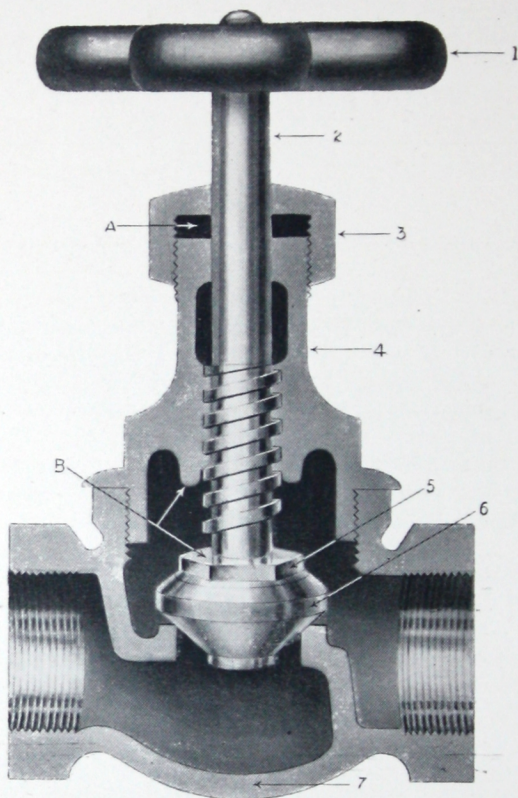
T. McAvity & Sons, Ltd., as a firm, have been established in the Brass and Iron Foundry business since the year 1834, as well as carrying on an extensive retail hardware trade. Their "home town" is Saint John (Canada's Winterport) in the province of New Brunswick, and here they have their four factories and the big hardware store. The "Brass Works" and the "Vulcan Iron Works" are the most important items in their "peace work" but probably these are given a close run for prestige by the "4.5" and "9.2" "Shell Plants" which in these stirring times are important factors and ones to be considered.

However, it is the "Brass Works" that is, the Brass Foundry and Machine Shops situated on the Harbor Front, wherein their line of Brass valves first sees the light of day, and for this reason, in this case, it is the chief point of interest. It is here also that all "McAvity" Brass Specialties are manufactured,— Marine Supplies, Railway and Locomotive Fittings of all kinds, Corporation Work and Pulp Mill Bronze, and in this plant employment is given to two hundred and fifty men.

But to get back to the starting point,—the construction of a valve—, it is probable that apart from those who make or use them, engineers, (not forgetting the "handy man about the house" who "fixes" the leaky kitchen "tap") and of

“McAvity World” Valve

in Section
Showing Heavy Construction



- | NO. | PARTS |
|-----|-----------------------------|
| 1 | Valve Wheel or Handle |
| 2 | Spindle |
| 3 | Packing Nut or Stuffing Box |
| 4 | Bonnet |
| 5 | Swivel Ring or Lock Nut |
| 6 | Disc |
| 7 | Body |

T. McAVITY & SONS, LIMITED,
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course the plumber, there are very few who know what a common globe valve is like "inside". Taking for an example a three quarter inch "McAvity World" brass screwed valve and following the various stages of the manufacture of its parts will be as good as any other way of finding out. Of course "McAvitys" make all kinds and sizes of both brass and iron valves but to deal with each one separately would require a regular "young library" of booklets such as this, (about a hundred and seventy-five different styles are shown in their catalogue.)

On the opposite page there is printed a sectional cut of the valve, which shows clearly the interior construction, working parts, and the proportionate thickness of the metal in the walls, seat, disc and the threaded ends, or, as they are termed "hexes". There are, as will be noted, only seven parts to the whole valve,— Number One,— the corrugated iron hand wheel by which the spindle Number Two is turned, and so, when opening the valve, raises the disc, Number Six from the seat which is a part of the body Number Seven. The bonnet Number Four, is indispensable, owing to the fact that the spindle depends upon it to give it its "rise in the World", while the packing nut, Number Three, is a sort of "Safety First" appliance, put there so that a packing ring composed of graphite impregnated asbestos may be inserted in the stuffing box —A— to prevent the escape of the steam and so to keep the user from getting "in wrong" with the fuel controller. Part Number Five is the disc lock nut or swivel ring which holds the disc to the end of the spindle but allows it (the disc) to turn freely. The disc, as, will be seen, is tapered to a forty-five degree angle, as also is the seat to correspond. This taper seat construction has been proved to be the best for high pressure valves and is usually recommended for use where over one hundred fifty pounds pressure (saturated steam) is carried, although a flat seat can be used for pressures ranging up to two hundred pounds and will generally give satisfaction.

The first operation in the manufacture of a valve is the making of the pattern. This is made from wood, white pine mostly, and of course a separate pattern is made for each different part, body, spindle, bonnet, etc. These wood patterns are then cast in a metal which is subject to very little expansion or contraction, probably about fifty or more reproductions of the one wood pattern being made in metal. The metal patterns are made exactly in halves and are fixed to iron plates having an absolutely true surface, each half pattern being joined to the next by means of a small strip of metal called a "gate". In the case of the body which is different on one side from what it is on the other, the side on which the "World" trade mark appears is put on the opposite side of the "gate" from the plain side, this arrangement being varied for the length of the plate.

The patterns on the plates are now ready for business and are transferred from the pattern storage department to the Moulding Shop. This shop is one

“McAvity World” Valve

Separate Parts

No. 3



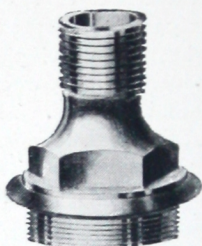
PACKING NUT

No. 1



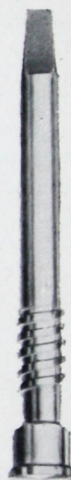
CORRUGATED
HAND WHEEL

No. 4



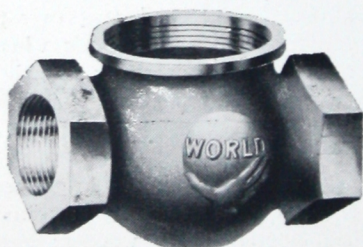
BONNET

No. 2



SPINDLE

No. 7



BODY

No. 6



DISC

NO. 5



LOCKNUT

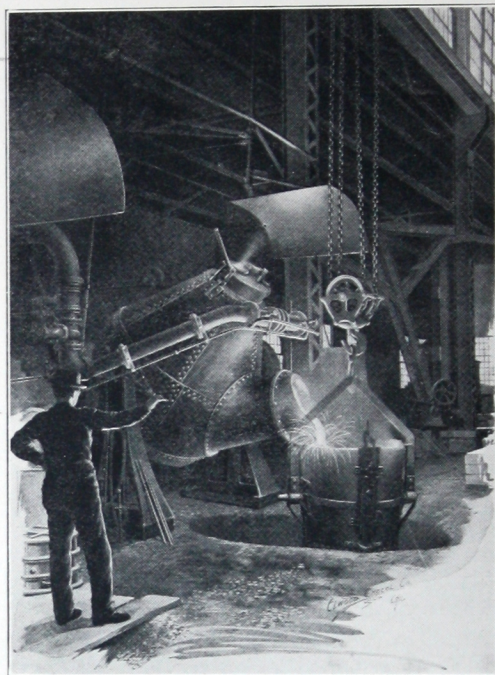
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SAINT JOHN, N. B.

of the most fully equipped in Eastern Canada, is well lighted and ventilated to carry off all gasses etc. arising from the molten metal. It is two hundred and fifty feet long seventy five feet wide and twenty feet from floor to roof. On one side are situated the furnaces, a battery of pit fire crucible furnaces, three forty two inch and one sixty inch Hawley Down Draft, Schwartz Oil Burning Furnaces giving the daily capacity of about twelve to fourteen tons of metal melted, while on the other side is a battery of the latest type Tabor Power Squeeze Vibrator Frame Moulding Machines. At the end of the shop there is space for tub moulders on special work, also floor space for heavy castings. A casting weighing two tons can be handled here with facility and the process of "pouring off" a casting of this size is quite an interesting process to watch but rather hot for those who do the actual work.

Now the patterns, having been brought to the Moulding Shop are placed on the Tabor Machines, mentioned above (that is of course the plate is put there) and an iron frame is placed around it thus forming a box, which, after the patterns have been dusted over with a "parting" sand to prevent sticking, is filled with moulding sand and rammed firm. A lever on the machine being pulled, the pattern plate drops away leaving the imprint of the patterns in the sand. This operation is repeated and the second frame is placed on top of the first thus forming "holes" in the sand exactly resembling the original wood pattern and making what is termed a mould. Each different valve part is made on a different machine and the number of the patterns on the plates varies with the relative size of the parts. In the case of the body twelve patterns are put on a plate together making twelve bodies when the metal is poured, while a small part like the swivel ring is cast fifty on a plate.

The valve body and the bonnet are what is termed "cored" work, meaning that a "core" of sand is put in the mould to make the interior of the casting "hollow". These cores as may be readily understood play a very important part in brass, or in fact in any kind of metal, moulding, and great care is exercised when they are being inserted in the moulds, as the walls of the valve body are in places scarcely a quarter of an inch thick and even a very small misplacement would result in a defective casting.

The cores are made of a sharp sea sand and Albany moulding sand with a binder of Linseed Oil, Glutrine, Vacuum Pan Molasses or a special Core Compound made for the purpose, and are compounded to a formula with as much care as "Aunt Jemima" uses to make her famous pancakes. When this mixture is well mixed it is formed into cores in iron core boxes which operate practically on the same principle that the bullet mould did, in which the "old timers" made their bullets, the difference being that the core boxes consist essentially of two separate parts, each part being half, which being placed together and filled with



One of the small Oil Furnaces in operation, metal being poured into ladle swung from overhead railway preparatory to being poured into the moulds. The temperature of the metal is approximately 1900° F.



“World” XX Loco. Globe Valves

Of taper disc construction are specially designed for Locomotive use and 250 pounds steam pressure.

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sand then taken apart, serve to turn out a whole core. In the centre of the core annealed iron wires are inserted which give it strength and allow it to be handled without breaking.

This work is done by experienced core makers every one of which has served three years apprenticeship at least, while some have been in McAvity's employ for twenty years or more.

Ovens are erected in the core department for the purpose of baking the cores and in these the sand cores are placed for a time varying with the size of each, until they are baked hard on the outside. An even temperature must be maintained throughout this process to secure the best results, but this also varies with the size of the work.

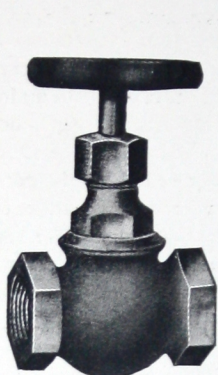
A core when baked has a hard smooth crust on the outside and on the inside a fine powder, and although it may be handled quite freely without fear of damage, a quick blow is generally enough to make it do the "Humpty Dumpty" act. The fine powder inside absorbs the gas from the hot metal and prevents the forming of gas pockets or "blow holes" in the casting.

Well so much for the cores.— The next thing is "pouring off" the metal. High class work such as the "World" valve parts are made from new metals entirely, no "scrap" can enter into their manufacture at all as a certain formula has to be followed out in order to secure a uniform appearance and to insure strength. The proportioning of this is in the charge of an expert and it goes into the furnaces under his supervision. When a certain temperature is reached the metal must be taken out of the furnace or it will get "burnt", this applying specially to alloys which contain zinc or "spelter".

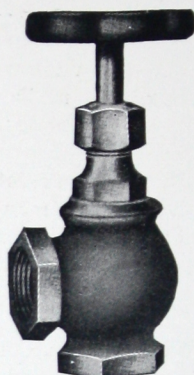
An overhead railway runs from the furnaces to all parts of the moulding shop and on this the molten metal is carried in iron ladles, slung with chains, to the moulds where it is poured.

After a certain time has elapsed the moulds are "dumped" and the castings taken from the sand. The valve bodies are given a "water dip", which gives them a color on the outside and which also removes all the "core". The other parts of the valve, after being cut apart are put in a sand blast machine where they are cleaned by sand being blown against them with an air pressure of about thirty pounds. This sand blast also removes the core sand from the bonnet. After the "sand blast" comes the grinding room where the marks of the "gate" are ground off. Then the rough test under a hydraulic pressure of two hundred and fifty pounds. The body and bonnet are given this test which prevents the

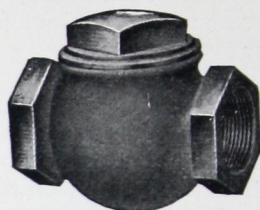
A Few "McAvity" Valves "Standard"



GLOBE



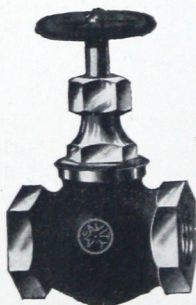
ANGLE



CHECK

These valves are a really well made and substantial article, presenting a good appearance and standing up well in use. They are regular standard brass seated valves and can be used where the working pressure does not exceed a hundred and twenty-five pounds.

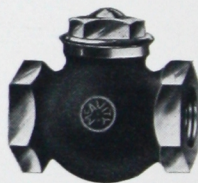
"McAvity Improved"



GLOBE



ANGLE



CHECK

The above are known as "McAvity's Improved" renewable Discs Valves and are fitted with special composition Discs and lock washers. Each valve is given a service test to twice the guaranteed working pressure which is a hundred and sixty pounds.

T. McAVITY & SONS, LIMITED,
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machining of defective castings, and so saves money for both "McAvitys" and "McAvitys' customers".

The "valve department" proper is next entered and here also the latest money and time saving appliances are installed. The turret lathes, screw machines and milling machines are fitted with air chucks which open and close with the touch of a lever and hold the work which is being machined without a chance of it being "off centre". (Messrs. Warner & Swasey Co., Ltd., Cleveland, Ohio issue a first class catalogue illustrating the above referred to machines. We have not space here). The female threads in the "hexes" of the body, in the packing nut, the disc and also in the top of the body where the bonnet screws in are cut with "collapsing" taps which close together when the thread is cut and do not have to be "backed" out. The dies which cut the male threads are "self opening" and carry out the same idea.

This is not a "machinists hand book" so the complicated details of the machine work can be skipped and the assembling of the different parts next referred to. Every part of the valve is machined exactly to gauge and interchangeability is thus secured. Each spindle is exactly the same as any other spindle, etc. and so if a customer desires to secure some new parts when the old ones become worn (after a year or so of hard service) he is certain to get parts that will fit his old valve. The assembling is an A—B—C, process;—the locknut is slipped over the spindle and screwed tight in the disc, the packing nut into which has been put the graphite asbestos packing ring, is screwed on the bonnet and the spindle goes up through. The "fittings" are screwed into the bonnet and the hand wheel is clinched on the spindle by a machine process,—then—Behold!! The perfect valve.

But it has yet to be proved perfect and to this end must be subjected again to a hydraulic test of at least twice the warranted service pressure. As a "World" valve is guaranteed to stand a steam pressure of a hundred and seventy-five pounds the test amounts to three hundred and fifty pounds. On some orders valves are required to be "tested to an actual air pressure" or "actual steam pressure" of so many hundred pounds and facilities are provided so that these tests may be given. Any valve which does not prove to be in class "A" under these tests is "exempted from service as physically unfit" and "scrapped" but owing to the fact that the individual parts have been given a rough test "exemptions" are rare.

After the final test has been given the hand wheels are painted with black enamel and dried. The valves then go into the wrapping room where girls are employed to wrap them in paper. Each separate valve is first wrapped in a semi waxed paper to exclude moisture, then four of them (varying with size)

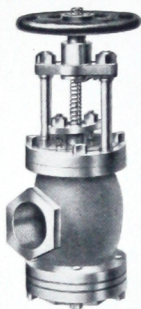
For Sulphite Mills

"World" Bronze Valves



**Fittings and Specials have been
proved to be**

"Quite Allright"



DIGESTER
RELIEF VALVE

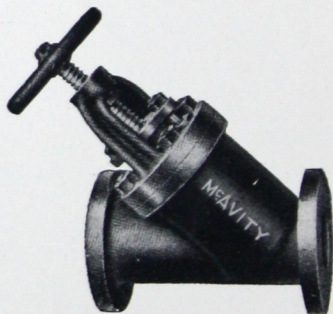
This "World" Acid Resisting Bronze Digester Relief Valve

Is used on the top of the Digester for relieving the accumulation of gas. As this is one of the hardest services in a Pulpmill to which a valve may be put, it has an extra thick regrinding Disc which gives it a long life.

"McAvity"

Bronze Y Valves

with their renewable Discs,
have found favor in Canadian
Mills from Coast to Coast.



FLANGED Y VALVE

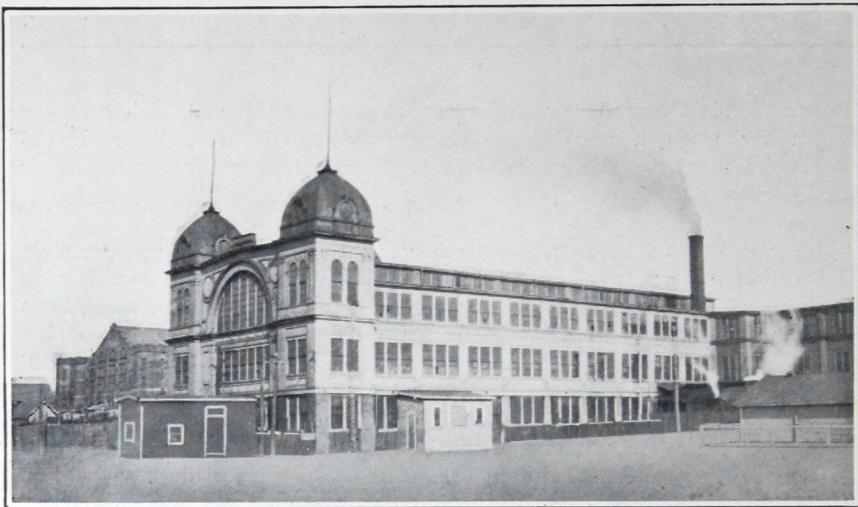
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are wrapped in a heavy hardware paper in one parcel and labeled. This wrapping is a newly instituted proceeding and is one which no doubt will be greatly appreciated by dealers and users as the product is protected by it from atmospheric conditions until the package is broken.

The packages go to the warehouse shelves, then into the shipping department and so aboard the outward bound freights, express trains or steamers leaving St. John. They are shipped to all parts of Canada from Halifax, N. S. to Victoria B. C. and to the West Indies, Australia, New Zealand, and so on, but wherever the "World" or "McAvity" valves go and are put to use you will find a man who will put in a good word for them.

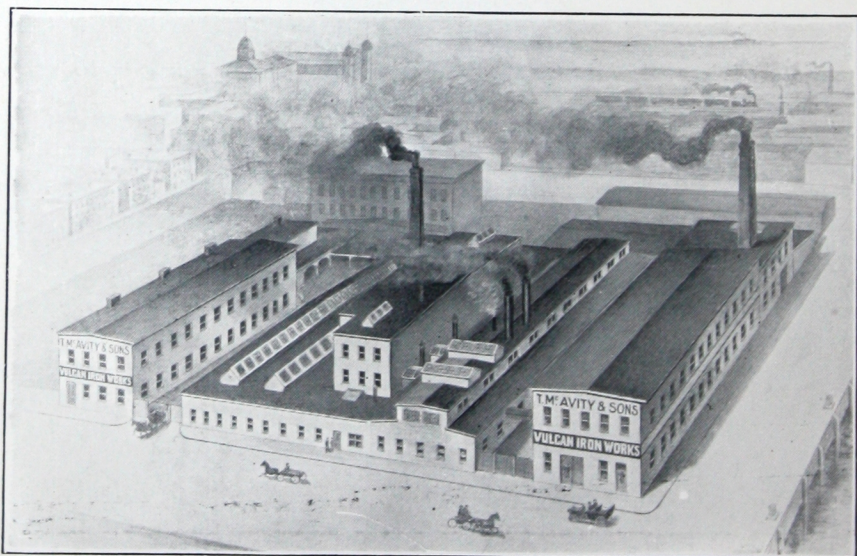
There are probably parts of this little story which are not entirely clear to the reader, but if the next time he comes to St. John he will pay a call on "The Brass Works" he will be shown in detail the way we make "World" and "McAvity" Brass Valves.





4.5 Shell Works—Exhibition Building

T. McAVITY & SONS, LIMITED
 SAINT JOHN, N. B.



Vulcan Iron Works—Broad Street



**Wholesale and Retail Hardware Establishment
King Street**

T. McAVITY & SONS, LIMITED,
SAINT JOHN, N. B.



Machine Shops—Rothsay Avenue



T. McAvity & Sons, Ltd.,

Saint John, N. B.

Canada